Column 442

Salmon in the trees

by Claire Eamer

Over the past summer, a couple of fisheries researchers from Vancouver have been looking for signs of salmon in the trees near Michie Creek in the southern Yukon.

No -- tree-nesting salmon are not the attraction. Mike Bradford and Jean Jang have been looking for a kind of nitrogen that salmon carry inland from the sea in their bodies.

Researchers Jean Jang (left) and Mike Bradford take cores from trees along Michie Creek in the southern Yukon.

(photo: Kathleen Bartel)

When the salmon spawn and die in streams like Michie Creek, their bodies become food for the plants and animals of the creek and its surroundings.

"Bears are probably the primary scavenger," says Bradford, a Fisheries and Oceans Canada researcher who works at Simon Fraser University.

Other consumers of inland salmon include birds, smaller mammals, insects and other invertebrates in the stream and along the bank, and the variety of tiny organisms that feed on dead things.

The creatures that feed directly on the salmon break down the food in their bodies and return some of it to the water and land, either directly through excretions or indirectly as they become food for other creatures. Plants of all sizes then pick up the recycled salmon nutrients from the earth and water.

The nutrients supplied by the spawning salmon are called marine-derived nutrients because they originate in the sea, the marine environment. The most reliable way to track their progress through the inland or terrestrial ecosystem is by tracking nitrogen-15.

Nitrogen-15 or 15N is a stable isotope or variant nitrogen. It's a slightly heavy version of the element, with an atomic weight of 15 instead of the more common atomic weight of 14. It's called "stable" because it doesn't change or decay over time.

Nitrogen-15 is much more common in the sea than in freshwater. It accumulates in

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some organs and tissues in the salmon while they are living and hunting in the ocean, and they bring it with them to the spawning grounds.

Bradford and Jang hope to find nitrogen-15 in the wood of trees 3000 kilometres upstream from the sea, along the banks of Michie Creek. Last year they confirmed that it's present in the soil and plant tissue near the spawning grounds. This year they took cores from spruce trees to analyze the tree rings for the presence of nitrogen-15.

"There's this idea -- maybe it's a bit of a dream -- that nitrogen-15 in the tree rings will give us a historical record of salmon abundance," explains Bradford.

He's not sure that the signal in the tree rings will be clear enough to provide the record he's looking for. Analysis of the cores is still underway. However, Bradford knows already that the technique won't work for every salmon-spawning stream.

"Bear pee is one of the main media to get the nitrogen into the soil," he says. The nitrogen signal tends to be strong enough to detect only at locations where there is a good annual concentration of salmon and regular use by bears.

"It takes those two parts of the puzzle to make it work."

Another limiting factor is the presence of alder. Spruce use the nitrogen-15 derived from the salmon if there isn't a better source of nitrogen in the soil. Alder produce that better source.

Alder have specialized nodules on their roots that transform nitrogen from the air into nitrogen-14 and leave it in the soil. Spruce will use the nitrogen-14 before the salmon-derived nitrogen-15, so the nitrogen-15 tends to stay behind in the soil.

"It's kind of a masking factor," says Bradford.

Still, there are locations like Michie Creek where the combination of salmon, bears, and lack of alder makes it possible to trace the passage of marine nutrients, even at a great distance from the marine environment. Bradford and Jang tested a chum salmon spawning site in the Kluane area this summer to see if it might be another suitable location.

So far, says Bradford, Michie Creek is the location furthest upstream from the sea, by a huge margin, where testing has revealed the nutrient trail marked by nitrogen-15. The results of this summer's field work should establish exactly how much information that trail holds.

For more information about salmon and marine-derived nutrients, contact Mike Bradford at mbradfor@sfu.ca.

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